Remarks

Claims 1, 2, 4-8, 10-12, 15-16, 21, 23-24, and 27-31 are before the Examiner for consideration.

Rejection under 35 U.S.C. §103(a)

The Examiner has rejected claims 1, 2, 4-6, 8, and 10 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,766,541 to Knutsson, *et al.* ("Knutsson"), which incorporates U.S. Patent No. 4,569,471 to Ingemansson, *et al.* ("Ingemansson), in view of U.S. Patent No. 6,254,810 to Delvaux, *et al.* ("Delvaux") and U.S. Patent No. 6,800,364 to Chiu, *et al.* ("Chiu"). The Examiner asserts that Knutsson teaches a method for making preforms from glass fiber strands where the glass fibers are texturized by separation to form a wool-type product prior to entry into the mold. The Examiner makes note that Knutsson makes reference by incorporation to U.S. Patent No. 4,569,471 to Ingemansson, *et al.* which assertedly teaches that the texturized wool fiber may travel through a hose prior to being fed into the mold. It is asserted that the binder, water, and glass fibers of Knutsson are fed into the mold and the mold is heated to cure the binder. The Examiner also asserts that Knutsson discloses that the binder preferably comprises about 2-10% by weight of the preform. The Examiner admits that Knutsson does not disclose that the binder is sugar in powdered or granulated form.

Chiu is cited for assertedly teaching the employment of a sucrose solution binder that can replace phenolic binders where the preform is heated to a temperature of about 200-300 °C to drive off the liquid from the binder and convert the sugar to an infusible, insoluble form. Delvaux is cited for teaching a strong protective coating for a fabric made of glass fibers where the protective coating contains sugar. The Examiner concludes that it would have been obvious to one of skill in the art to have employed a sugar solution such as a sucrose solution as suggested by Chiu and Delvaux in the method of Knutsson to provide an excellent protective cover for the fabric and to replace the binder of Knutsson with an environmentally friendly binder.

In response to this rejection, Applicant respectfully directs the Examiner's attention to independent claim 1 submits that claim 1 defines a method of forming a preform that is not taught or suggested within Knutsson, Delvaux, and Chiu, either alone or in any combination.

In particular, Applicant respectfully submits that neither Knutsson nor Delvaux teaches or suggests the utilization of a liquid sugar binder as claimed in claim 1. With respect to Knutsson, Applicant submits that Knutsson is silent with respect to any teaching or suggestion of the use of a sugar binder. In fact, it is submitted that Knutsson does not teach or suggest the use of sugar, as a binder or otherwise. Delvaux specifically teaches an aqueous suspension of wollastonite, colloidal silica, and sugar. (*See, e.g.*, column 3, lines 27-31). Applicant submits that an aqueous solution of wollastonite, colloidal silica, and sugar is very different from a liquid sugar binder. It is therefore submitted that neither Knutsson nor Delvaux teaches or suggests the liquid sugar binder, or the step of feeding a liquid sugar and glass fibers into a preform mold, claimed in claim 1. Further, Applicant submits that if Delvaux was combined with Knutsson, the combination would not result in the method of forming a preform for a muffler as claimed in claim 1. Indeed, the combination would result in the addition of wollastonite, colloidal silica, and sugar to glass fibers, not the addition of a liquid sugar.

Additionally, Applicant submits that Knutsson specifically teaches the utilization of a powdered binder. (*See, e.g.*, column 1, lines 62-63; column 3, lines 59-61; and column 8, lines 50-51). Applicant therefore submits that one of skill in the art reading Knutsson would have no motivation to look elsewhere for a non-powdered binder.

Further, Applicant respectfully submits that the method of Knutsson would destroy a sugar binder. Knutsson teaches heating the mold to a curing temperature, which, Applicant submits, is higher than the caramelization temperatures of sugars. Applicant submits that a curing temperature would destroy the sugar binder and render it useless for its intended purpose. For example, Knutsson teaches heating the mold to a temperature to cure a non-sugar binder, *i.e.*, a phenolic binder, whose curing temperature is from about 300-400 °C (572-752 °F). Such temperatures are well beyond the caramelization temperatures of sugars. (*See, e.g.*, Attachment A, www.food-info.net/uk/colour/caramel.htm). Thus, it is respectfully submitted that if a sugar binder was used in Knutsson, the sugar binder would be destroyed by the high temperatures utilized by Knutsson and would render the binder useless for its intended purpose.

Assuming, *arguendo*, that one of skill in the art were to look to Chiu for a suitable heating temperature as suggested by the Examiner, Chiu also teaches destructive heating temperatures. Chiu teaches that if the preform is used in a filtration process, the preform is

heated to a temperature of about 200-300 °C. (*See, e.g.*, column 5, lines 42-45). However, this is not the final heating of the preform. Chiu further teaches that the preform is then heated to a final temperature of about 900-2000 °C. (*See, e.g.*, column 5, lines 60-65). It is submitted that such temperatures are far beyond the caramelization temperature of sugars and would also destroy the sugar binder. Applicant respectfully submits that to evaluate the obviousness or non-obviousness of an invention, both the prior art reference(s) and the claimed invention as a whole must be considered. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2005, §2141.02 citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983) and *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983)). Thus, Applicant submits that it is improper to ignore the teaching of Chiu in which the final heating temperatures of the preform are from about 900-2000 °C because, as a whole, Chiu teaches the utilization of a temperature well above the caramelization of sugars. As such, it is respectfully submitted that the combination of Knutsson, Delvaux, and Chiu would not result in the method claimed in claim 1.

In addition, Applicant submits that there is no motivation for one of skill in the art to arrive at the method claimed in claim 1 based on the disclosures of Knutsson, Delvaux, and/or Chiu. To establish a *prima facie* case of obviousness, there must be some motivation, either within the reference or in the knowledge of those of skill in the art, to modify the reference or combine the references' teachings, there must be a reasonable expectation of success, and the prior art references must meet all of the claim limitations. (*See, e.g., Manual of Patent Examining Procedure*, Patent Publishing, LLC, Eighth Ed., Rev. 3, August 2007, §2142). It is respectfully submitted that one of ordinary skill in the art would not be motivated to arrive at a method of forming a preform for a muffler that includes (1) texturizing glass strands by separating the glass strands into individual glass fibers prior to feeding the glass fibers into a preform mold, (2) feeding liquid sugar and the glass fibers into the preform mold, (3) heating the preform mold to a temperature sufficient to at least partially caramelize the sugar, where the caramelized sugar adheres to the glass fibers to form sugar-coated glass fibers, and (4) cooling the preform mold to bind the sugar-coated glass fibers together and form the preform based on the teachings of Knutsson, Delvaux, and Chiu. The combination of Knutsson, Delvaux, and Chiu simply does not teach or suggest the claimed

method. Without some teaching or suggestion, there can be no motivation, and without motivation, there can be no *prima facie* case of obviousness.

In view of the above, Applicant respectfully submits that claim 1 is patentably distinguishable over Knutsson, Delvaux, and Chiu, either alone or in combination. Because claims 2, 4-6, 8, and 10 are dependent upon independent claim 1 and contain the same elements as claim 1, claims 2, 4-6, 8, and 10 are also submitted to be non-obvious and patentable.

Accordingly, Applicant respectfully submits that claims 1, 2, 4-6, 8, and 10 are not obvious over Knutsson in view of Delvaux and Chiu and respectfully requests that the Examiner reconsider and withdraw this rejection.

Rejection under 35 U.S.C. §103(a)

Claim 7 has been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,766,541 to Knutsson, *et al.* ("Knutsson"), which incorporates U.S. Patent No. 4,569,471 to Ingemansson, *et al.* ("Ingemansson"), in view of U.S. Patent No. 6,254,810 to Delvaux, *et al.* ("Delvaux") and U.S. Patent No. 6,800,364 to Chiu, *et al.* ("Chiu") as applied to claims 1, 2, 4-6, 8, and 10 above, and further in view of U.S. Patent No. 5,317,037 to Golden, *et al.* ("Golden"). The Examiner asserts that the combination of cited references does not expressly teach the melting point of the powdered sugar. In this regard, Golden is cited for teaching that sugars can be used as binders and that the sugars have a melting point in the range of 120 °C (248 °F) to 175 °C (347 °F). The Examiner asserts that it would have been obvious to one of skill in the art to employ a sugar such as sucrose, fructose, or dextrose as the sugar binder in the combination set forth above for the purpose of employing readily available and well-known sugars as effective binders.

In response to this rejection, Applicant respectfully directs the Examiner's attention to claim 1 and to the arguments set forth above with respect to the rejection of claims 1, 2, 4-6, 8, and 10 under 35 U.S.C. §103(a) to Knutsson in view of Delvaux and Chiu and submits that claim 1 defines a method of forming a preform for a muffler that is not taught or suggested within Knutsson, Delvaux, and Chiu. In addition, Applicant submits that the teachings of Golden do not add to the Examiner's rejection so as to make claim 1 unpatentable. Even with the addition of the teachings of Golden, Knutsson, Delvaux, and Chiu still do not teach or suggest a method of forming a preform for a muffler that includes (1) texturizing glass

strands by separating the glass strands into individual glass fibers prior to feeding the glass fibers into a preform mold, (2) feeding liquid sugar and the glass fibers into the preform mold, (3) heating the preform mold to a temperature sufficient to at least partially caramelize the sugar, where the caramelized sugar adheres to the glass fibers to form sugar-coated glass fibers, and (4) cooling the preform mold to bind the sugar-coated glass fibers together and form the preform as claimed in claim 1. As such, it is submitted that the combination of Knutsson, Delvaux, Chiu, and Golden does not teach or suggest Applicant's invention as recited in claim 1. Because claim 7 is dependent upon claim 1, which, as discussed in detail above, is not taught or suggested by Knutsson, Delvaux, Chiu, and Golden, Applicant submits that claim 7 is also not taught or suggested by Knutsson, Delvaux, Chiu, and/or Golden.

In view of the above, Applicant respectfully submits that claim 7 is non-obvious and patentable over the combination of Knutsson, Delvaux, Chiu, and Golden and respectfully requests that the Examiner reconsider and withdraw this rejection.

Rejection under 35 U.S.C. §103(a)

Claim 31 has been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,766,541 to Knutsson, *et al.* ("Knutsson"), which incorporates U.S. Patent No. 4,569,471 to Ingemansson, *et al.* ("Ingemansson), in view of U.S. Patent No. 6,254,810 to Delvaux, *et al.* ("Delvaux") and U.S. Patent No. 6,800,364 to Chiu, *et al.* ("Chiu") as applied to claims 1, 2, 4-6, 8, and 10 above, and further in view of U.S. Patent Publication No. 2003/0087095 to Lewis, *et al.* ("Lewis"). The Examiner asserts that the combination of references does not expressly teach the employment of sugar syrups. In this regard, Lewis is cited for assertedly teaching a method of using high fructose corn syrup as a binder. The Examiner concludes that it would have been obvious to one of skill in the art to modify the method of Knutsson to employ corn syrup or high fructose corn syrup as the binder since Lewis suggests that they are an alternative form of sugar suitable for employment as a binder.

In response to this rejection, Applicant respectfully directs the Examiner's attention to claim 1 and to the arguments set forth above with respect to the rejection of claims 1, 2, 4-6, 8, and 10 under 35 U.S.C. §103(a) to Knutsson in view of Delvaux and Chiu and submits that claim 1 defines a method of forming a preform for a muffler that is not taught or suggested within Knutsson, Delvaux, and Chiu. In addition, Applicant submits that the teachings of

Lewis do not add to the Examiner's rejection so as to make claim 1 unpatentable. Even with the addition of the teachings of Lewis, Knutsson, Delvaux, and Chiu still do not teach or suggest a method of forming a preform for a muffler that includes (1) texturizing glass strands by separating the glass strands into individual glass fibers prior to feeding the glass fibers into a preform mold, (2) feeding liquid sugar and the glass fibers into the preform mold, (3) heating the preform mold to a temperature sufficient to at least partially caramelize the sugar, where the caramelized sugar adheres to the glass fibers to form sugar-coated glass fibers, and (4) cooling the preform mold to bind the sugar-coated glass fibers together and form the preform as claimed in claim 1. As such, it is submitted that the combination of Knutsson, Delvaux, Chiu, and Lewis does not teach or suggest Applicant's invention as recited in claim 1. Because claim 31 is dependent upon claim 1, which, as discussed in detail above, is not taught or suggested by Knutsson, Delvaux, Chiu, and Lewis, Applicant submits that claim 31 is also not taught or suggested by Knutsson, Delvaux, Chiu, and/or Lewis.

In view of the above, Applicant respectfully submits that claim 31 is non-obvious and patentable over the combination of Knutsson, Delvaux, Chiu, and Lewis and respectfully requests that the Examiner reconsider and withdraw this rejection.

Indication of Allowable Subject Matter

Applicant appreciate the indication of allowance of claims 11, 12, 15, 16, 21, 23, 24, and 27-31 and requests that these claims be passed to allowance with the remaining claims in the application.

Conclusion

In light of the above, Applicant believes that this application is now in condition for allowance and therefore requests favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized to charge payment or credit any overpayment to Deposit Account No. 50-0568 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

Date: 9-12-08

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Registration No. 40,360

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Attachment A

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Wageningen University

Caramelization

Caramelization is one of the most important types of browning processes in foods, together with Maillard reactions and enzymatic browning. Carmelization leads desirable colour and flavour in bakery's goods, coffee, beverages, beer and peanuts. Undesirable effects of caramelization are for example burned sugar smell and blackening.

Caramelization causes important changes in foods, not only in colour but also in flavour. As no enzymes are involved in the carmelization process, it is a non-enzymatic browning reaction.

Caramelization occurs during dry heating and roasting of foods with a high concentration of carbohydrates (sugars).

Simply speaking, caramelization is the process of removal of water from a sugar (such as sucrose or glucose) followed by isomerization and polymerisation steps. In reality the caramelization process is a complex series of chemical reactions, which is still poorly understood.

The process of caramelization starts with the melting of the sugar at high temperatures, followed by foaming (boiling). At this stage saccharose (sugar) decomposes into glucose and fructose. This is followed by a condensation step, in which the individual sugars lose water and react with each other to for example difructose-anhydride. The next step is the isomerization of aldoses to ketoses and further dehydration reactions. The last series of reactions include both fragmentation reactions (flavour production) and polymerization reactions (colour production).

Caramelization starts at relatively high temperatures as compared to the other browning reactions, and depends on the type of sugar. Table 1 below shows the initial caramelization temperatures of some common carbohydrates. This table is based on pure carbohydrates. In foods often several different carbohydrates and other components are present; all these may influence the caramelization temperature as well as the different steps and reactions, and thus the final flavours and colours that are produced.

Table 1 : Initial caramelization temperatures of common carbohydrates

Sugar	Temperature
Fructose	110° C
Galactose	160° C
Glucose	160° C
Maltose	180° C
Saccharose	160° C

The highest rate of the colour development is caused by fructose as caramelization of fructose starts at lower temperature. Baked goods made from honey or fructose syrup thus are generally a bit darker than those made with sugar.

During caramelization several flavour components as well as polymeric caramels are produced. Caramels are complex mixture of various high molecular weight components. They can be classified into three groups:

- Caramelans ($C_{24}H_{36}O_{18}$)
- Caramelens ($C_{36}H_{50}O_{25}$)
- Caramelins ($C_{125}H_{188}O_{80}$)

These polymers are often used as colours in commercial food products, from colas to soy sauce, confectionary and ice-cream. They are labelled as E150.

Commercial caramels are produced directly by heating sugar, or by heating sugar in the presence of co-factors, such as ammonia or sulphite. This results in caramels with different colours or charged caramels. These aspects are very important for the use of different caramels in foods. Caramels used to colour soft drinks should be negatively charged to prevent reaction with phosphates which causes precipitation and loss of colour. On the other hand, caramels used for bakery goods should be positively charged.

The different stages of caramel production all have distinct names, based on the characteristics of the product, see table 2 below. Thread indicates the fact that sugar can be spun into soft or hard threads, ball indicates that sugar easily can be moulded into a proper shape, crack indicates that the sugar will hard after cooling (and cracks when it is broken). Only when colour appears the names refer to caramel.

Table 2 : Stage of caramelization of saccharose (table sugar)

Step		Temperature °C	Description and use	Image
1	Evaporation of water	100	Sugar is melted and impurities rise to the surface;	
2	*Small Thread*	102	No colour; soft cooling; no flavour change. Used in frostings.	
3	*Large Thread*	104	No colour; soft cooling; no flavour change. Used in preserves.	

4	*Small Ball*	110 - 115	No colour; semi-soft cooling; no flavour change. Used in cream candy fillings, Italian meringue, fondants, fudge, and marshmallows;	
5	*Large Ball*	119 - 122	No colour; firm cooling; no flavour change. Used in soft caramels;	
6	*Light Crack*	129	No colour; firm cooling; no flavour change. Used in semi-hard candies.	
7	*Hard Crack*	165 - 166	No colour; hard cooling; no flavour change. Used in butterscotch and hard candies;	
8	*Extra-hard Crack*	168	Slight colour; shatters like glass during cooling; no flavour change. Used in hard candies;	
9	*Light Carmel*	180	Pale amber to golden brown; rich flavour.	
10	*Medium Carmel*	180 - 186	Golden brown to chestnut brown; rich flavour;	
11	*Dark Carmel*	188 - 204	Very dark and bitter; smells burned. Used for colouring, but lack of appropriate sweetness;	
12	Black Jack	210	Also known as "monkey's blood." At this point, the sugar begins to breaks down to pure carbon. Burning flavour.	

Caramelization reactions also result in the formation of flavours. Diacetyl is an important flavour compound, produced during the first stages of caramelization. Diacetyl is mainly responsible for a buttery or butterscotch flavour. Diacetyl is not only produced by caramelization, it can also be produced by bacteria in fermented products, such as beer and yoghurt.

Besides diacetyl hundreds of other flavour compounds are produced for instance furans like hydroxymethylfurfural (HMF) and hydroxyacetylfuran (HAF), furanones such as hydroxydimethylfuranone (HDF), dihydroxydimethylfuranone (DDF) and maltol from disaccharides and hydroxymaltol from monosaccharides.

Hydroxymethylfurfural (HMF) is found in honey, juices, milk but also in cigarettes. Hydroxyacetylfuran (HAF) has a sweet aroma and a low odour threshold. Maltol has a taste reminiscent of freshly baked bread and is used as a flavour enhancer (E636) in breads and cakes.

References:

- Food Chemistry, Dennis D. Miller, 1993
- Larousse Encyclopaedia of food
- http://en.wikipedia.org
- Images : http://www.supertoinette.com/recettes/caramel_fo.htm

Food-Info.net is an initiative of Wageningen University, The Netherlands

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Caramelization starts at relatively high temperatures as compared to the other browning reactions, and depends on the type of sugar. Table 1 below shows the initial caramelization temperatures of some common carbohydrates. This table is based on pure carbohydrates. In foods often several different carbohydrates and other components are present, all these may influence the caramelization temperature as well as the different steps and reactions, and thus the final flavours and colours that are produced.

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